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(54) **Rotary printing press control**

(57) Each unit of the press has a control system (1) comprising a primary station (3) which receives nominal values of working parameters from a central control system (11), each primary station (3) being connected to at least one application converter (5) which receives nominal values from the station (3) and actual values from a respective actuator (22) in order to regulate the actuator.

As shown, the central control system (11) receives inputs from a control panel (13) or an external computer or servicing device (12). The arrangement also includes supervisory control systems (2) and secondary stations (4).

The invention enables the system (1) to be standardised, regardless of the supervisory control system (2).

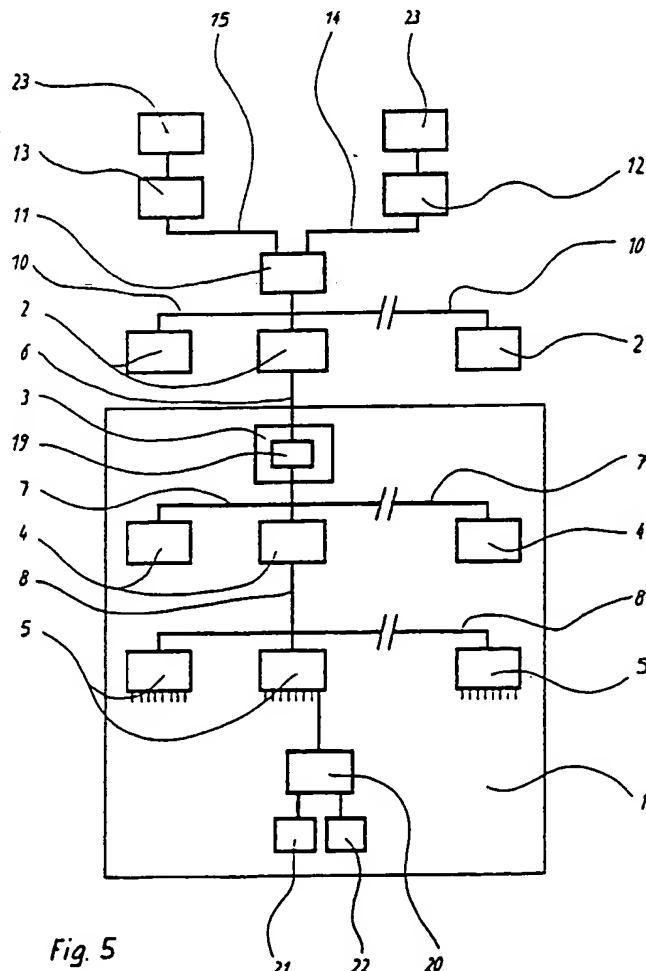


Fig. 5

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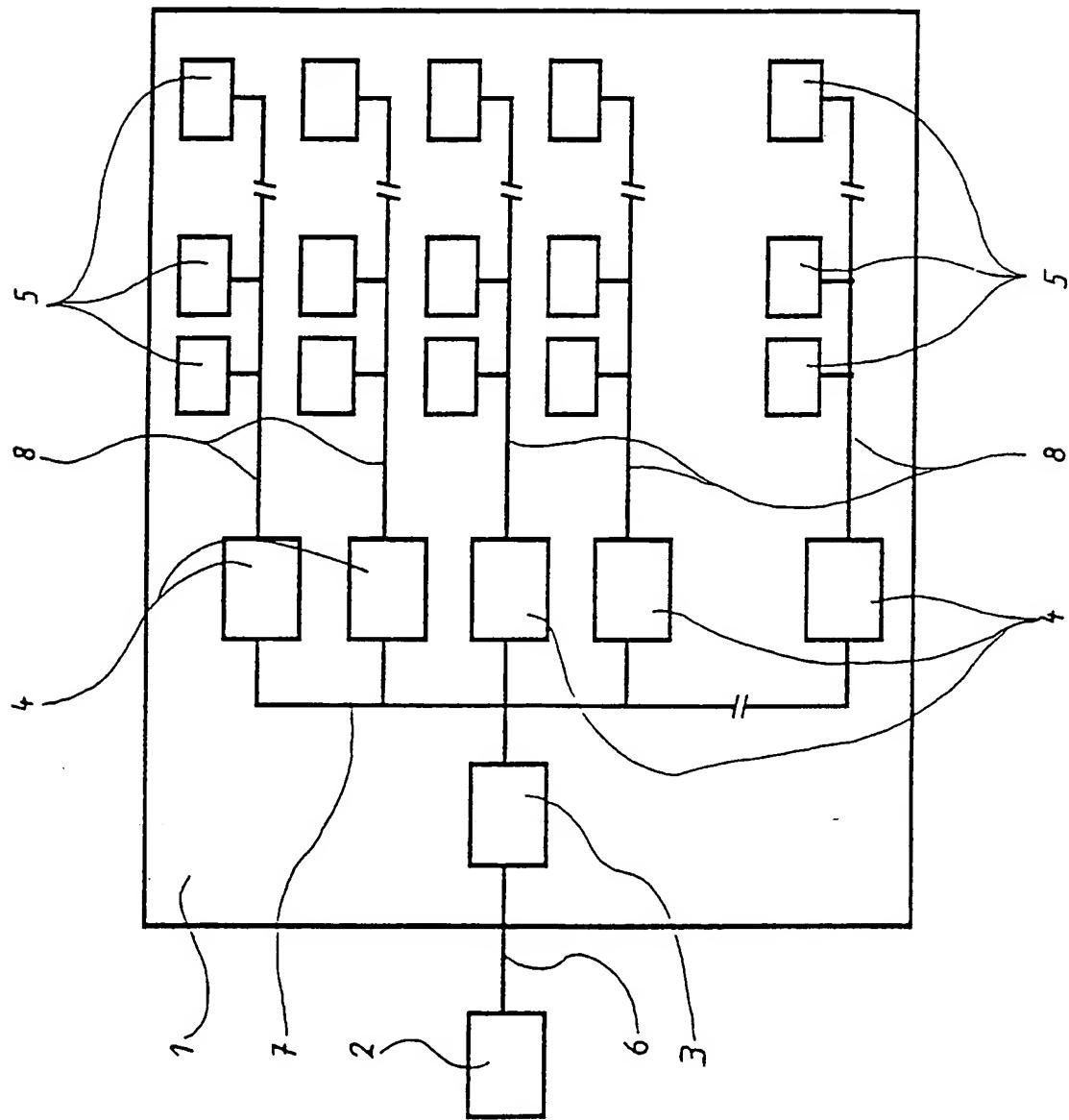


Fig. 1

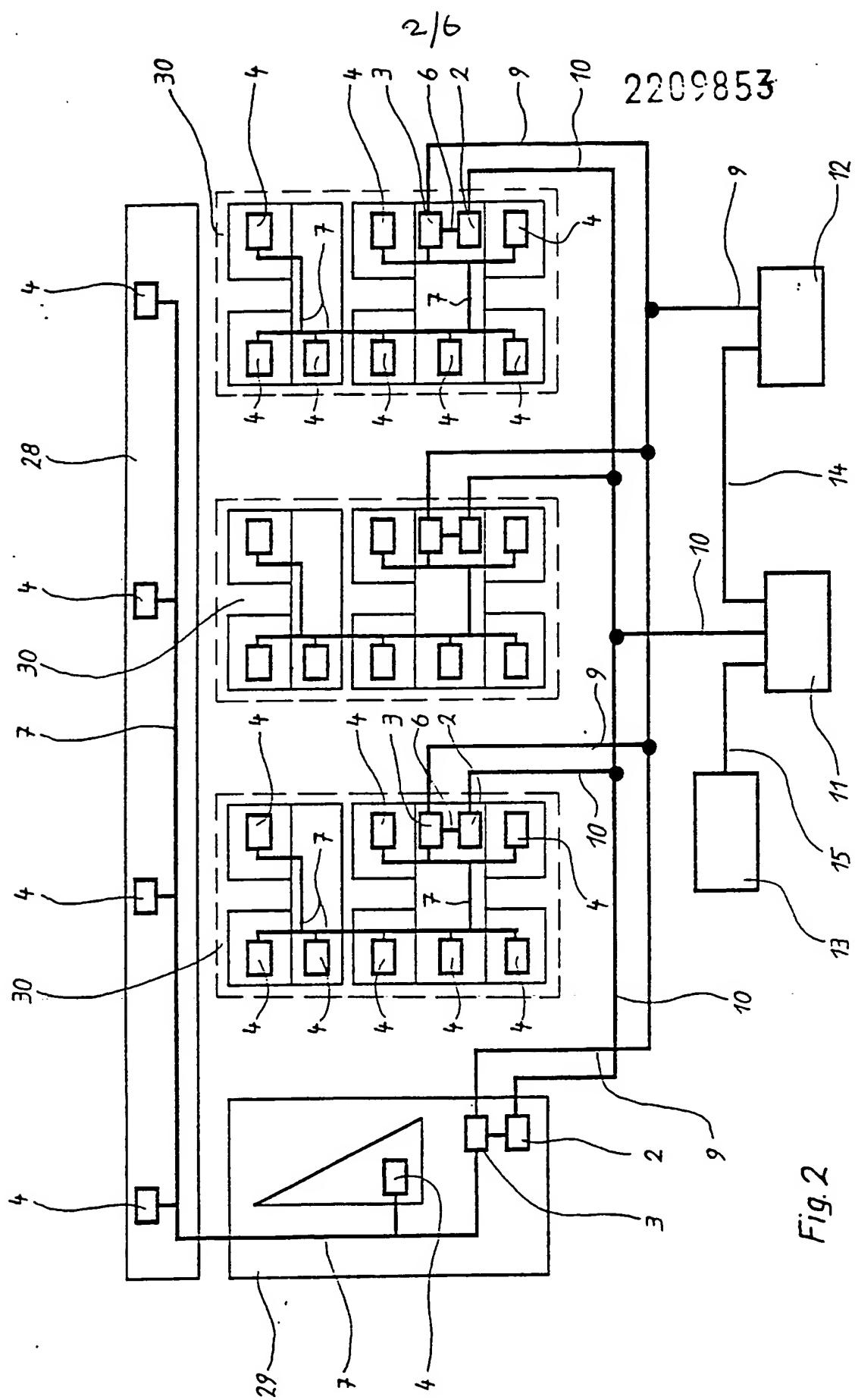


Fig. 2

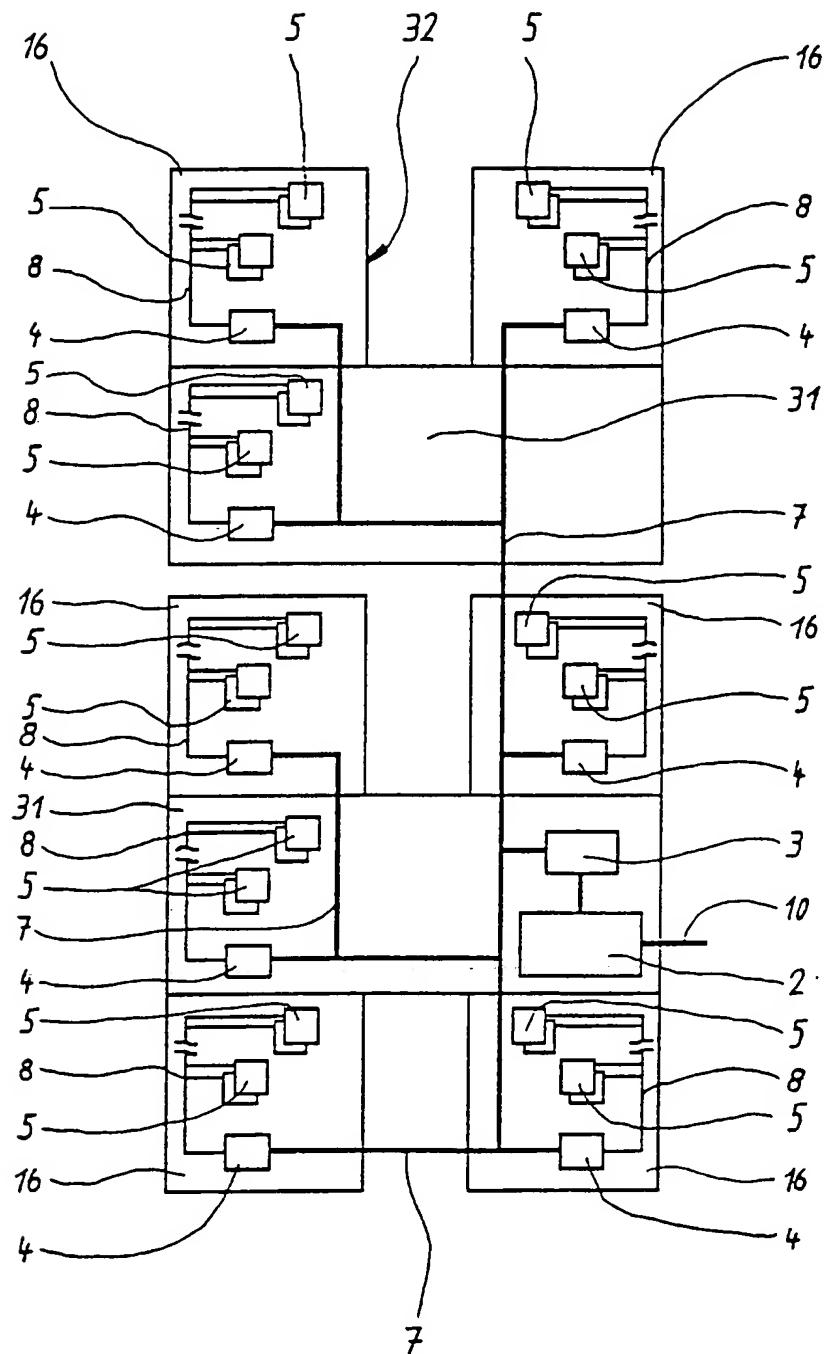


Fig.3

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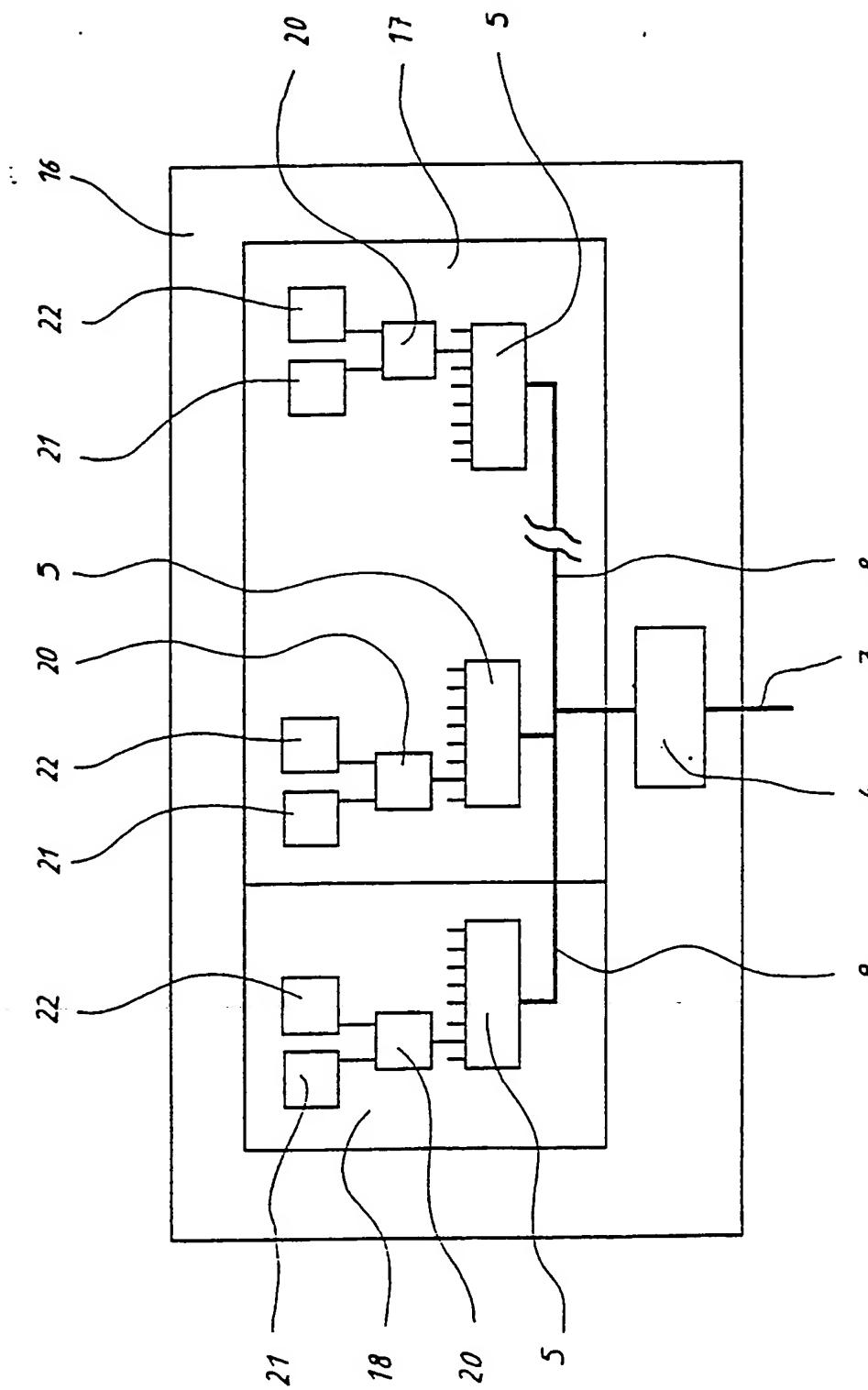


Fig. 4

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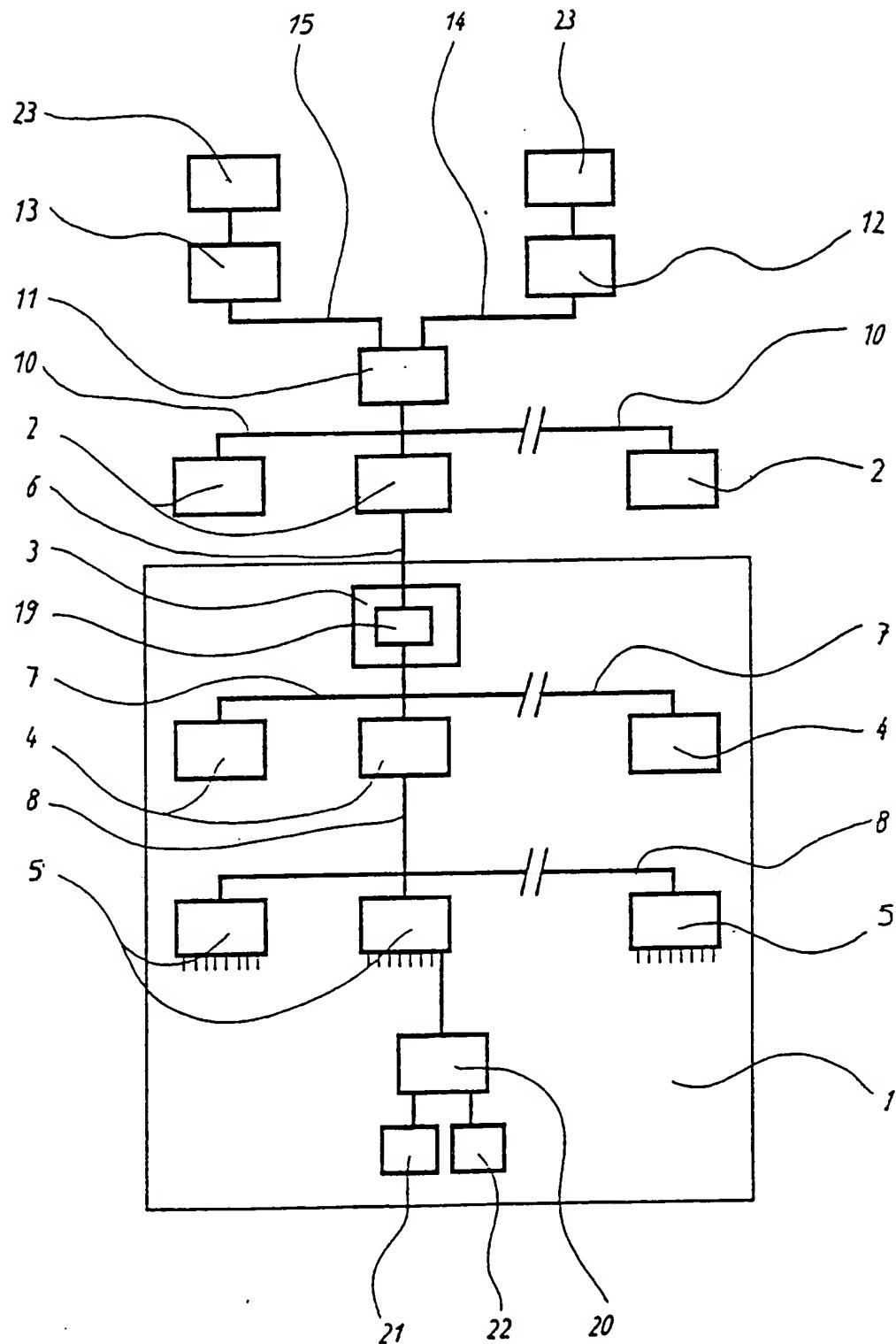


Fig. 5

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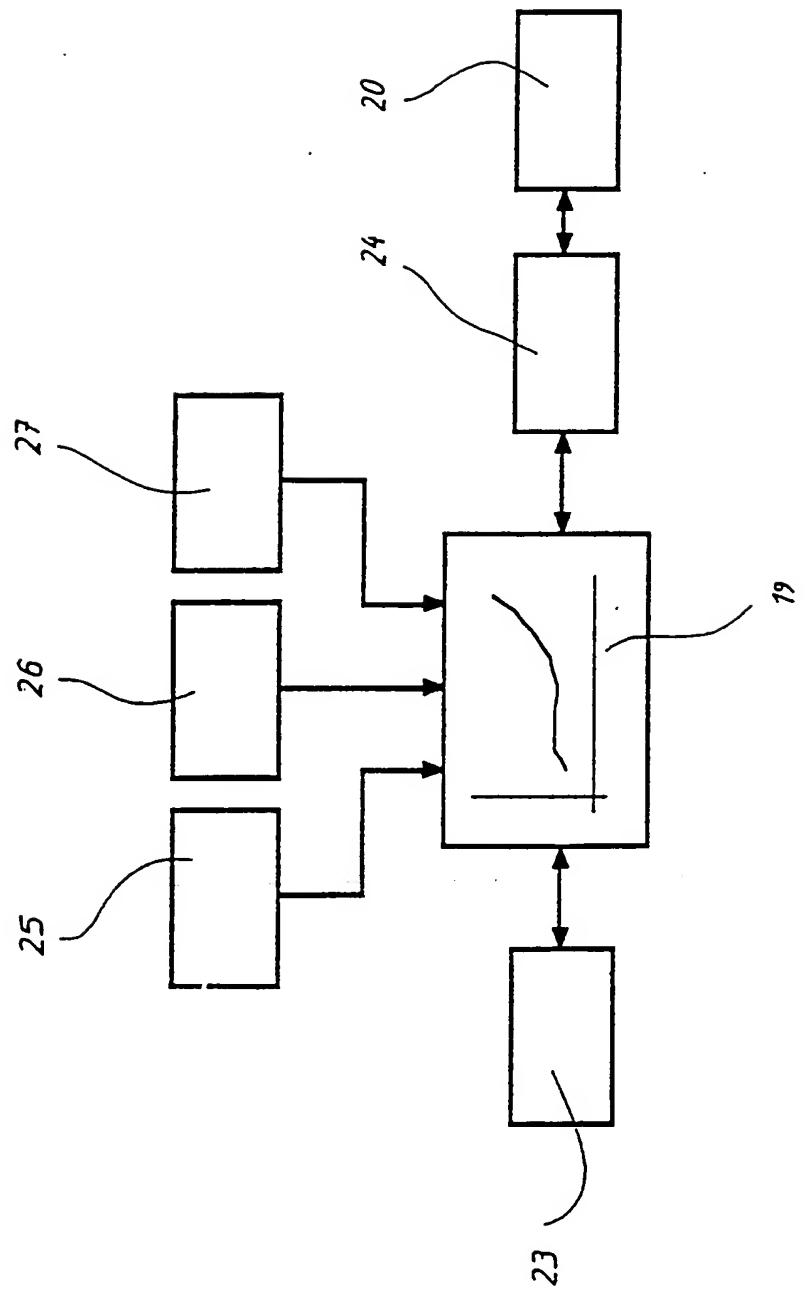


Fig. 6

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A system for setting working parameters of a rotary printing press

The invention relates to a system for setting the working parameters of a rotary printing press of the type comprising control elements associated with individual working parameters, actuators for the individual control elements, controlling and regulating devices (allotted to the printing units, the folding apparatus, and any auxilliary units) for the actuators, and a control panel for the input of nominal values.

With a system such as this, all the essential working parameters and quality guide functions can be set, in particular colour guide, colour register, web guide register, and subsidiary functions.

It is known to use computers for setting printing presses, see for example DE-OS 29 22 964 which reveals a system for preparing and controlling printing presses which works with a colour processor, a guide processor, a damping unit processor and a compensation processor. These processors give control signals for colour guide, water guide, web guide and for any compensations.

A system for setting the working parameters of a rotary printing press of the type mentioned is obtainable from Maschinenfabrik WIFAG, Bern, Switzerland, under the name "WIFAG MARS", and from BBC AG, Baden, Switzerland, under the name "MPS 2". Here the control elements of the quality guide functions are consistently integrated as a subset into the whole control system of the rotary printing press. This system consists of a combination of individual memory-programmable controls which form a subset (completely independent as regards hardware and software) of the control system, associated with each printing unit, of the whole composite system.

These known systems provide a control panel for the input of the relevant nominal values, and controlling and/or regulating devices, allotted to the printing units, the folding apparatus and any auxiliary units, for the actuators of the control elements associated with the individual working parameters; these controlling and/or regulating devices generally take the form of memory-programmable processors.

Thus, for example, to each printing unit is allotted a memory-programmable computer which conveys, centrally for this printing unit, the control signals via cables to the control elements which convert the quality guide functions into an appropriate mechanical setting at the

appropriate place in the rotary printing press. This means on the one hand that each computer has to have a large number of digital or analogue connections and on the other hand a very large amount of cabling is required.

Because of the varying lengths of the signal lines, additional length adaptation for analogue inputs is also necessary. The hardware loading of this system is also very high.

A system such as this makes great demands on software as well, since, besides the administration of data and state, the individual control elements are readjusted.

A printing unit consists of many mechanical assemblies which carry out functions complete within themselves. When however a memory-programmable control system is allotted to each printing unit centrally, these printing units have to be completely set up and the whole setting system completely installed and ready for operation, before the individual assemblies can be set in operation and their functions tested. Setting and calibration of the individual functions of the different assemblies of such a printing unit of a rotary printing press cannot therefore be done until the plant is completely set up. This means however that commissioning such a printing

unit involves great expenditure and as a rule cannot be done until the machine is delivered to the customer and the whole rotary printing press is set up and ready.

The same problems are encountered when an existing rotary printing press is to be further extended, for example by attaching a further printing unit. There are no mechanical problems in building-in additional printing units, but the quality guide functions have to be ensured in this additional printing unit as well. Therefore the appropriate actuators/control elements have to be connected to the computer which is centrally allotted to this printing unit. This involves very high expenditure on cabling, and it also has to be taken into account that the work in question has to be done on a machine which is already installed and often still running.

Furthermore, limits are soon reached with regard to capacity and connection possibilities, these limits being combined with problems of space. Here also, commissioning and testing of the individual functions of the expansion printing unit cannot be done until the setting system is completely installed. This also means that further extension of an existing rotary printing press takes a great deal of time, and that at least individual printing units, if not the rotary printing

press, have to be at a standstill until the work in question is entirely finished.

According to the invention, there is provided a system as defined in the appended claim 1.

Preferred embodiments of the invention are defined in the other appended claims.

It is thus possible to set up, commission, test and calibrate individual independent assemblies (intended to carry out quality guide functions) independently of the whole plant and of the whole control system.

All the mechanically independent assemblies which have to carry out quality guide functions are equipped with the control components necessary to set them, which enables commissioning to take place independently of the control system of the whole rotary printing press.

These assemblies do not even have to be set up in the whole machine plant but can be ready set up beforehand and then inserted into the machine system. This leads to considerable reduction in the time needed for final installation of such a rotary printing press, and also to a reduction in commissioning time, since the setting systems of the individual assemblies can be set up, tested and calibrated outside the rotary printing press.

Because of the clear segregation of the setting system according to the individual assemblies, the cabling and in particular the length of the individual cables can be optimised in terms of short paths.

Up to now, most printing press manufacturers have obtained the necessary control systems from special suppliers which are specified in each case by the customer, i.e. the printing works. There is a problem here in that each supplier of control systems uses his own memory-programmable control systems with his specific hardware and a special programming language, so that a specific solution has to be worked out for each machine type and each supplier of control systems. In particular, the measuring and control elements, which are integrated into the machine plant at the actual point of intervention, frequently have to be adapted to the control functions of the control system to be used, although the functions have the same purpose.

This is now no longer necessary, since each primary station has at least one interface for the bidirectional, bit-serial, asynchronous exchange of data, and this interface is supported by most control systems of various manufacturers; this means that each primary station can be coupled with practically any

desired stations of a composite control system. The primary station converts the nominal operating values received from the control system into effective nominal values, or vice versa can supply present actual values and convert them into actual operating values which are indicated on the control panel.

This interface enables "machine-specific components", namely control elements and actuators in particular, to be coupled with the control systems of any desired manufacturer, so that expensive adaptation, usual up to now, to systems obtainable on the market is no longer necessary.

Each primary station may be connected with a secondary station which serves as a kind of "buffer" and has a connection for the purpose of testing and calibrating the various machine-specific components independently of the control system. This means that even further extension of an already existing rotary printing press can be done without problems and without having to put up with long down-times of the machine. All the additional assemblies are already "pre-set" and commissioned before they are installed in the existing printing press. Any servicing needed can also be done very efficiently.

These advantages also result when an existing rotary printing press is being equipped for a higher degree of automation, since the devices for feedback signals are provided on the machine-specific components and can thus easily be connected to an existing control system.

This modular structure also enables the control system of the quality guide functions to be standardised, i.e. the machine-specific components, namely measuring and control elements and actuators, can be coupled into the rotary printing press in a standard way; these machine-specific components can be coupled with any desired control systems on the market, so they are independent of the range available from the supplier of the control system. It is even possible to standardise the actual machine-specific components regardless of the machine type, which gives even greater flexibility in constructing a system from the different modules available.

The invention will be further described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a block circuit diagram of a positioning system;

Fig. 2 is a diagram of the spatial arrangement of the positioning system in a rotary printing plant;

Fig. 3 is a diagram of the spatial arrangement of the positioning system in a printing tower;

Fig. 4 is a diagram of the spatial dividing-up of an application converter in a printing mechanism;

Fig. 5 is a data flow chart of the rotary printing plant of Fig. 2; and

Fig. 6 shows, in diagrammatic form, the conversion of operating values into effective values and vice versa

The positioning system 1 shown in Fig. 1 consists of a primary station 3 which is connected with the supervisory control system 2 via a bit-serial, asynchronous data connection 6. Up to two hundred and fifty-four secondary stations 4 can be connected to the primary station 3. Each secondary station 4 can have a maximum of thirty application converters 5. The primary station 3 is connected with the secondary stations 4 by means of a first serial internal distribution network 7. Each secondary station 4 is connected to its application converters 5 by a second serial internal distribution network 8.

The rotary printing plant shown in Fig. 2 consists of printing towers 30. Each of the printing towers 30 consists of a printing unit 31 with four printing mechanisms 16 and a colour deck 32 consisting of a printing unit 31 with two printing mechanisms 16. The rotary printing plant also includes a folding unit 29 and a superstructure with auxiliary drive 28. The superstructure with auxiliary drive 28 serves in a known way in particular for web guide, web tension regulation and web register regulation. The rotary printing plant is equipped with a known central control system 11, a known control panel 13 and an external device 12 (computer or servicing machine).

A positioning system 1 with a primary station 3 is integrated in each printing tower 30 and in the folding unit 29. A secondary station 4 is built into each printing unit 31 and into each printing mechanism 16.

The positioning system 1 of the folding unit 29 contains, as well as a secondary station 4 which is arranged in the folding unit, the secondary stations 4 which are installed in the superstructure and auxiliary drive 28.

The distribution of the positioning systems 1 over the

rotary printing plant in the way mentioned, and the arrangement of the secondary stations 4 on the spot in the relevant assembly, permit the separate function testing and the calibration of the quality guide control elements without the printing towers and the folding unit being connected to the central control system 11 or to the supervisory control system 2. The secondary stations 4 have an interface to which a testing device can also be connected which in its turn is equipped with a primary station. This type of function-testing and calibration of the quality guide control elements can thus be done before the individual, ready-set-up assemblies are built together to form a whole plant, and before they are connected to the central control system 11 or to the supervisory control system 2.

This gives great flexibility for re-equipping the printing towers 30 and the whole plant itself.

The primary stations 3, which are integrated in the printing towers 30 and in the folding unit 29, are connected via a serial connecting line 10 to the central control system 11. Thus the quality guide functions are passed on in the form of nominal operating values from a control panel 13 (which is connected to the central control system 11 by means of a connection 15) to the printing towers 30 or folding unit 29 which are to be

addressed. These nominal operating values first reach a supervisory control system 2 whence they are taken over by the primary station 3 of the positioning system 1. Here they are processed into the effective nominal values demanded by the secondary stations 4.

The primary stations 3 are connected to an external device 12 via a connecting line 9. The external device 12 can for example be a computer or a servicing device.

If the external device 12 is a servicing device, servicing operations or subsequent calibrations can be done on the positioning system 1 via the connecting line 9.

If the external device is a computer, it is connected to the central control system 11 by a first connection 14; this serves to give out and feed back nominal operating values, and thus enables pre-setting or storing of the positions of the quality guide control elements.

Fig. 3 shows a printing tower 30 of the rotary printing plant shown in Fig. 2. The secondary stations 4 which are connected via the first internal distribution network 7 to the primary station 3 and are integrated in each case into the appropriate assemblies of the printing tower 30, are connected via a second internal

distribution network 8 to the application converters 5.

Each printing mechanism 16, as shown in Fig. 4, has a secondary station 4. The printing mechanism 16 has a colouring unit 17 and a damping unit 18. The colouring unit 17 and the damping unit 18 have application converters 5 connected to the secondary station 4 via a second internal distribution network 8. Each of the application converters 5 has several connecting points to which the null-seeking circuits 20 with a control-element actual-value feedback 21 and a control element drive system 22 can be connected.

The data flow chart shown in Fig. 5 shows that the nominal operating values 23 are put into the central control system 11 of the rotary printing plant via the external device 12 (computer or servicing device) via a first connection 14 or via the control panel 13 via a second connection 15. The central control system 11 passes on these nominal operating values 23 via the second connecting line 10 to the appropriate supervisory control system 2 which in its turn supplies them to the primary station 3 of the positioning system 1 via the data connection 6. In the primary station 3 the nominal operating values 23 are converted into the effective nominal values 24 (Fig. 6) in a conversion part 19 in a way specific to the zero-seeking circuit. These

effective nominal values 24 are conveyed via the first internal distribution network 7 to the appropriate secondary station 4 and thence via the second internal distribution network 8 to the appropriate application converter 5, whence the effective nominal values 24 are given to the appropriate zero-seeking circuit 20.

The effective nominal value 24 and the effective actual value of the relevant zero-seeking circuit 20 can be converted into nominal operating values 23 or actual operating values via the same path previously described in the reverse sequence, in the conversion part 19 of the primary station 3, and fed back to the control panel 13 or to the external device 12 (computer or servicing device).

Fig. 6 shows diagrammatically the conversion of the nominal operating values 23 into the effective nominal values 24. The conversion of the values of a zero-seeking circuit 20 at any time in the conversion part 19 of the primary station 3 depends on the type of conversion 25, the conversion parameters 26 and the calibration parameters 27. The nominal operating value 23, the effective nominal value 24 and the values of the conversion type 25, the conversion parameters 26 and the calibration parameters 27 are held memory-resident in the primary station 3. These values can be loaded or

read by the external device 12 (computer) via the first connecting line 9.

The module of the communication software of the primary station 3 of the positioning system 1, which supports the communication to the supervisory control system 2, can be simply adapted to the communication trace routine required by whichever supervisory control system 2 is used.

The set of commands for communication between the positioning system 1 and the supervisory control system 2 always remains the same and is subordinate to the communication trace routine.

C L A I M S

1. A system for setting working parameters of a rotary printing press of the type comprising: control elements associated with individual working parameters; actuators for the individual control elements; controlling and regulating devices for the actuators; and a control panel for the input of nominal values; the system comprising at least one primary station provided in each printing unit, folding apparatus and auxiliary unit of the rotary printing press, which primary station receives nominal values from a central control system, each primary station being connected with at least one application converter which is associated with at least one actuator, each application converter receiving nominal values from an associated primary station and actual values from the respective actuator and regulating the respective actuator.
2. A system as claimed to Claim 1, in which each primary station is provided with communication interfaces.
3. A system as claimed in Claim 2, in which at least

one of the communication interfaces of the primary stations (3) is an interface for bidirectional, bit-serial, asynchronous exchange of data.

4. A system as claimed in any one of Claims 1 to 3, in which each primary station converts into effective nominal values the nominal operating values received from the central control system.
5. A system as claimed in any one of Claims 1 to 4, in which each primary station, on interrogation, feeds back the existing actual values and converts them into actual operating values.
6. A system as claimed in any one of Claims 1 to 5, in which a secondary station is arranged between each primary station and its relevant application converters.
7. A system as claimed in Claim 6, in which the connection between the primary station and the respective secondary station is formed by a serial bus.
8. A system as claimed in Claim 6 or 7, in which each secondary station and the respective application

converters are connected by a serial bus.

9. A system as claimed in any one of Claims 6 to 8, in which the primary stations and/or the secondary stations are provided with connections for external testing equipment for commissioning, calibration and carrying out test runs.
10. A system for setting working parameters of a rotary printing press, substantially as described with reference to and as illustrated in the accompanying drawings.
11. A rotary printing press including a system as claimed in any one of the preceding claims.